LEVEL II

1

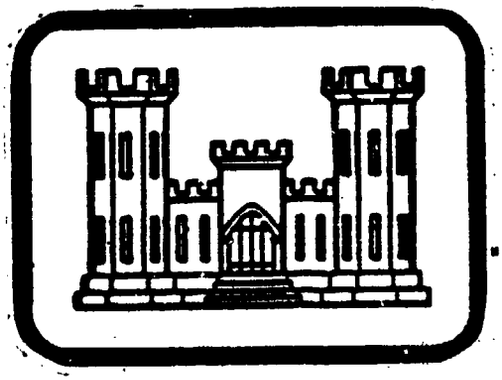
OHIO RIVER BASIN
TRIBUTARY TO CHARTIERS CREEK
WASHINGTON COUNTY

PENNSYLVANIA
NDI No. PA 00865
PENN DER No. 63-92

MONTOUR No. 4 REFUSE BANK

CONSOLIDATION COAL COMPANY
EASTERN REGION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



"Original contains color plates: All DTIC reproductions will be in black and white"

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
CONSULTING ENGINEERS
1000 BANKSVILLE ROAD
PITTSBURGH, PENNSYLVANIA 15216

JULY 1981

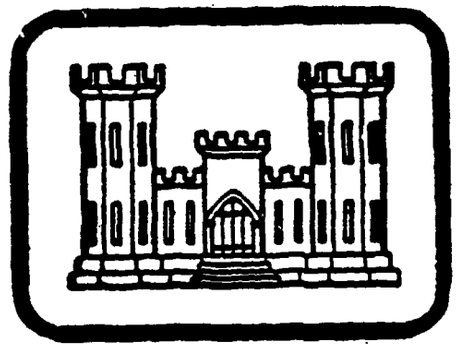
OHIO RIVER BASIN

MONTOUR NO. 4 REFUSE BANK
WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI NO. PA 00865
PennDER NO. 63-92

CONSOLIDATION COAL COMPANY
EASTERN REGION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DACW31-81-C-0027



Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
Consulting Engineers
1000 Banksville Road
Pittsburgh, Pennsylvania 15216

Date: July 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington. D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, materials testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some time in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Montour No. 4 Refuse Bank
STATE LOCATION:	Pennsylvania
COUNTY LOCATION:	Washington
STREAM:	Unnamed tributary to Chartiers Creek
DATE OF INSPECTION:	5 May 1981
COORDINATES:	Lat. 40°17'46" Long. 80°07'06"

ASSESSMENT

Based on a review of available information, visual observations of conditions as they existed on the date of the field inspection, and supporting engineering calculations, the general condition of the Montour No. 4 Refuse Bank is considered to be fair.

This assessment is based primarily on visual observations of the embankment.

The structure is classified as a "large" size, "significant" hazard dam. Corps of Engineers guidelines recommend the Probable Maximum Flood (PMF) as the Spillway Design Flood for a "large" size, "significant" hazard dam. Montour No. 4 Refuse Bank's Spillway Design Flood is the Probable Maximum Flood. Reservoir capacity is "adequate" because the non-overtopping flood inflow was found, by using the HEC-1 computer program, to be in excess of 100 percent of the PMF.

The Phase I investigation revealed deficiencies which should be corrected or improved through implementation of the following recommended improvement efforts.

RECOMMENDATIONS

1. Embankment Improvements: The owner should immediately develop and implement a plan for improving surface drainage and providing erosion control to halt the further degradation of the Montour No. 4 Refuse Bank. The improvements should be permanent and designed so as to require little or no maintenance.

2. Emergency Operation and Warning Plan: The owner should develop an Emergency Operation and Warning Plan including:

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Montour No. 4 Refuse Bank

a. Procedures for around-the-clock surveillance during emergency conditions.

b. Procedures for drawdown of the reservoir under emergency conditions.

c. Procedures for notifying downstream residents and public officials, in case evacuation of upstream or downstream areas is necessary.

3. Maintenance and Inspection Procedures: The owner should develop written maintenance and inspection procedures in the form of checklists and step-by-step instructions.

Samuel G. Mazzella 17 July 1981
Samuel G. Mazzella Date
Project Engineer

James P. Hannan 17 July 1981
James P. Hannan Date
Project Engineer

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
James Ellsworth Barrick, II
ENGINEER
No. 22639-E

James E. Barrick 17 July 1981
James E. Barrick, P.E. Date
PA Registration No. 022639-E

Approved by: James W. Peck
James W. Peck
Colonel, Corps of Engineers
Commander and District Engineer

11 Aug 81
Date

MONTOUR No. 4 REFUSE BANK

OVERVIEW

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MONTOUR NO. 4 REFUSE BANK
NATIONAL I. D. NO. PA 00865
PennDER No. 63-92

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

a. Authority: The Phase I investigation was performed pursuant to authority granted by Public Law 92-367 (National Dam Inspection Act) to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose: The purpose of the investigation is to make a determination on whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances:

(1) Embankment: Montour No. 4 Refuse Bank was constructed as a tram-dumped coarse coal refuse disposal facility. The embankment is 1400 feet long and has a maximum height of 231 feet and a crest width that varies from 80 to 125 feet. The embankment's upstream slope was measured to be 1.2H:1V. The downstream slope varied from 1.5H:1V to 1.7H:1V.

(2) Outlet Works: The outlet works consists of a trailer-mounted pump located near the upstream end of the impoundment.

(3) Principal (and Emergency) Spillway: There is no defined principal or emergency spillway for the bank. A drainage channel for an acid mine drainage treatment pond located upstream of the Bank has been excavated across the Bank's right abutment and defines the maximum possible impoundment pool elevation.

(5) Freeboard Conditions: Approximate freeboard between the pool elevation at the time of the inspection and the crest of the embankment was measured to be 94 feet.

(6) Downstream Conditions: The unnamed tributary to Chartiers Creek below Montour No. 4 Refuse Bank flows through a narrow valley for about 1000 feet where it joins Chartiers Creek. Within the first 1000 feet below Montour No. 4 Refuse Bank, the Montour Railroad track (abandoned), an abandoned Acid Mine Drainage plant and an undeveloped road lie on the floodplain. In the first 2000 feet below the confluence with Chartiers Creek, there are as many as five inhabited dwellings and a highway bridge on the floodplain.

(7) Reservoir: The Montour No. 4 Refuse Bank's reservoir was about 1000 feet long at the time of the inspection. At the maximum pool elevation, the reservoir would be about 2600 feet long.

(8) Watershed: The watershed contributing to Montour No. 4 Refuse Bank consists mostly of woodland with some residential development. The watershed above the dam is 0.21 square mile.

b. Location: Montour No. 4 Refuse Bank is located across an unnamed tributary to Chartiers Creek in Peters Township, Washington County, Pennsylvania, approximately one mile northwest of McMurray, Pennsylvania.

c. Size Classification: Montour No. 4 Refuse Bank is approximately 231 feet high from downstream toe to crest. Its maximum impounding height is about 189 feet and the associated storage capacity is 1749 acre-feet. Based on Corps of Engineers guidelines, Montour No. 4 Refuse Bank is a "large" size structure.

d. Hazard Classification: Montour No. 4 Refuse Bank is classified as a "Significant" hazard dam. In the event of a dam failure, an abandoned railroad, an Acid Mine Drainage plant, a Chartiers Creek highway bridge, and as many as five inhabited dwellings could be subjected to possible damage and loss of a few lives could result.

e. Ownership: Montour No. 4 Refuse Bank is owned by the Consolidation Coal Company, Eastern Region, Washington, Pennsylvania. Inquiries concerning the dam should be addressed to:

Consolidation Coal Company
Eastern Region
450 Racetrack Road
Washington, PA 15301
Attention: Mr. Marshall W. Hunt,
Regional Manager of Engineering and
Environmental Quality Control
(412) 746-3400

f. Purpose of Dam: The Montour No. 4 Refuse Bank was constructed as a coarse coal refuse waste disposal facility. The resulting impoundment was used for storage of acid water pumped from the owner's Montour No. 4 Mine.

g. Design and Construction History: Construction of the Bank began in the 1920's by the Pittsburgh Coal Company and was continued by Consolidation Coal Company, the current owner.

h. Normal Operating Procedure: The Montour No. 4 Mine is abandoned and there is no water pumped to the impoundment. Periodically, due to the inflow of surface runoff, the pond level is pumped down by a portable pump. There are no permanent facilities for pool level control, nor is there a principal or emergency spillway to pass flood flows.

1.3 PERTINENT DATA

a. Drainage Area	.21 sq. mi.
b. Discharge at Dam Facility	
Maximum Flood at Dam Facility	Unknown
Principal Spillway Capacity at Top of Embankment	Zero
c. Elevation (feet above MSL)	
Design Top of Embankment	Unknown
Current Top of Embankment	1142±
Maximum Possible Pool Level	1100±
Pool at Time of Inspection*	1046
Maximum Tailwater	Unknown
Downstream Toe of Embankment	910.9
d. Reservoir Length	
Maximum Pool	2600 feet
Pool at Time of Inspection	1600 feet
e. Reservoir Storage	
Maximum Pool	1749 acre-feet
Pool at Time of Inspection	332 acre-feet
f. Reservoir Surface	
Maximum Pool	43.5 acres
Pool at Time of Inspection	13.0 acres

*Datum for field measurements as estimated from USGS topographic map.

g. Embankment

Type	Tram-Dumped Coarse Coal Refuse
Length	1400 feet
Height	231 feet
Maximum Impounding Height	189 feet
Crest Width	Varies
Slopes	
Downstream	1.5H:1V to 1.7H:1V
Upstream	1.2H:1V
Impervious Core	Unknown
Grout Curtain	Unknown

h. Principal Spillway

Type	None

i. Emergency Spillway

Type	None

j. Outlet Works

Type	Portable Pump
Location	Near Upstream End of Impoundment

SECTION 2
ENGINEERING DATA

2.1 DESIGN

a. Design History: No information was found on the design history of this structure.

b. Date Available: The data available for review included:

(1) A copy of a National Dam Inventory Form.

(2) A photocopy of the 7-1/2 Minute USGS Bridgeville Quadrangle showing the structure's location.

(3) Conversations with the owner's representative during the field investigation on 5 May 1981.

2.2 CONSTRUCTION

a. Construction: Montour No. 4 Refuse Bank was constructed by dumping coarse coal refuse materials from an aerial tram. The Bank was begun in the 1920's by the Pittsburgh Coal Company and continued until the 1950's by Consolidation Coal Company.

b. Modification: There are no reported modifications to the structure after its completion.

A discharge channel has been constructed into natural ground at the right end of the Bank. The channel drains an acid mine drainage (AMD) treatment pond that has been constructed into and on the right reservoir slope immediately upstream of the Bank. The channel would also serve as a principal (and emergency) spillway for the impoundment created by the Bank if the water level were permitted to rise approximately 54 feet.

A considerable amount of recently end-dumped (ungraded) earth and topsoil materials were observed on the Bank crest on the date of inspection. The owner's representative indicated the materials are intended to be used as part of a planned reclamation program.

2.3 OPERATION

a. Dam: The Bank operates without a dam tender and no operational data are available.

b. Principal (and Emergency) Spillway: There is no spillway at this facility.

c. Outlet Works: The outlet works consists of a portable pump that operates on an as-needed basis. Whenever the pool elevation rises to a level that would endanger Hidden Valley Road at the upstream end of the impoundment, the water is drawn down to a safe level.

2.4 EVALUATION

a. Availability: No information was available from the Pennsylvania Department of Environmental Resources. The available operation and construction information was obtained from Consoldation Coal Company personnel.

b. Adequacy: The available design information, supplemented by field inspection and supporting engineering analyses presented in succeeding sections, is adequate for the purposes of this Phase I Inspection Report.

c. Validity: There appears to be no reason to question the validity of the very limited available information.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General: The field inspection of Montour No. 4 Refuse Bank was performed on 5 May 1981 and consisted of:

(1) Visual observations of the embankment crest and slopes, groins and abutments;

(2) Visual observations of the outlet works;

(3) Visual observations of the embankment's downstream toe area, including drainage channels and surficial conditions;

(4) Transit stadia field measurements of relative elevations across the embankment slopes;

(5) Visual observations of the reservoir shoreline and watershed;

(6) Visual observations of downstream conditions and evaluation of the downstream hazard potential.

The visual observations and measurements were made during periods when the reservoir and tailwater were at normal operating levels.

The visual observations checklist, field sketch and sections containing the observations and comments of the field inspection team are contained in Appendix A. Specific observations are illustrated on photographs in Appendix C. Detailed findings of the field inspection are presented in the following sections.

b. Dam Configuration: Montour No. 4 Refuse Bank is an extensive deposit of coarse coal refuse that has been deposited across the valley of an unnamed tributary to Chartiers Creek to form an impounding embankment of considerable height. A portion of the refuse materials have been burned, resulting in a heterogeneous red, yellow and brown material known as "reddog."

No emergency or principal spillway was observed. A drainage channel from an AMD pond in the impoundment zone would function as a spillway in the unlikly event that the pond level would rise by more than fifty feet.

c. Embankment:

(1) Crest: The crest of Montour No. 4 Refuse Bank was irregular both horizontally and vertically. The embankment attained its greatest height near the center and was generally level for a considerable distance in both directions. The embankment dropped significantly toward each abutment but considerable freeboard above the pond level was maintained.

No cracks or significant discontinuities were observed that would indicate movement or slope instability.

The right portion of the crest contained a considerable amount of end dumped earth and topsoil materials that contained sparse grass and brush vegetation. No other vegetation was observed anywhere on the crest of the embankment.

The crest has suffered significant erosion due to movement of surface runoff on the unvegetated, non-cohesive refuse materials.

(2) Upstream Slope: The upstream face of the embankment was generally irregular both from crest to toe and abutment to abutment. The upstream face contained numerous erosional gullies that have resulted from surface runoff over unvegetated slopes for many years. Locally, very steep slopes were observed at numerous places.

(3) Downstream Slope: The downstream face of the embankment consists of three predominant sections; an upper slope, a central bench, and a lower slope.

The upper slope was generally irregular, steep, unvegetated and extensively eroded in a manner similar to the upstream face. However, no cracks, scarps or sloughing indicative of slope instability were observed.

The bench, at approximately mid-height on the downstream face, was generally irregular in both width and slope. The bench contained numerous shallow to very deep erosional gullies caused by surface runoff from the crest and upper slope of the embankment. Pronounced drainage channels have developed on the bench that direct flows either to the right abutment area or to a deep erosional gully near the center of the embankment.

The lower slope appeared to be considerably older than the upper slope, crest or upstream slope. The lower slope was generally vegetated by trees, brush and weeds. Careful observation of exposed materials in the erosional gully at the center of the slope suggested that these materials were in an advanced state of weathering as compared to materials observed on the upper portions of the Bank.

The lower slope was generally irregular from both toe to crest and abutment to abutment. Large boulders of reddog material were observed on and immediately below the lower slope. Surface materials were observed to be generally loose. Several animal burrows were observed on the lower slope.

No cracks, scarps, or signficant discontinuities were observed that would indicate movement or instability of the downstream slope.

(4) Seepage: Three wet spots were observed in the exposed materials in the erosional gully on the lower slope. The wet spots were located approximately five feet below the level of the bench and were generally small (1 to 2 square feet). Seepage flows were too small to measure.

The remainder of the embankment surfaces observed, including deep erosional gullies, drainage swales, and drainage channels on and about the embankment, were quite dry on the date of inspection. No seeps, swamps or indications of swampy, wet conditions were observed anywhere else on the embankment.

d. Abutments:

(1) Right: The right abutment at and above the embankment is mildly to steeply sloped and contains a large deposit of coarse coal refuse materials. The lower abutment is a moderate to steep natural valley wall which is heavily wooded and contains dense underbrush.

The junction of the embankment and abutment was tree and brush covered and was observed to be generally dry and uneroded from the crest to the bench. Below the bench, the embankment toe approached the top of slope of a natural drainage swale that crosses the right abutment. Exposed bedrock surfaces at several locations in the drainage swale were emitting groundwater in significant quantities (10-20 gpm estimated total). No movement of soil fines was observed and there was no indication of subsurface erosion.

(2) Left: The left abutment was generally mild to moderately steep and was heavily wooded and contained dense underbrush on the date of inspection.

The junction of the abutment and embankment contained a drainage channel that has eroded into natural ground at the toe of the embankment. The drainge swale was irregular and contained considerable debris, including logs, brush, reddog boulders and sections of plastic pipe. Along the lower portion of the embankment, the drainage swale is quite steep and flows are directed into a relatively undefined channel across both refuse materials and natural soils. Considerable erosion has occurred in the lower toe area of the embankment.

e. Principal and Emergency Spillways: No spillways were observed at this impounding structure.

f. Outlet Works: The outlet works for Montour No. 4 Refuse Bank is an electric motor operated pump located near the upper end of the reservoir. The pump is manually controlled and is used only when waterlevels in the reservoir become excessive after precipitation events. Normal outflow from the reservoir is by infiltration and evaporation.

g. Reservoir:

(1) Slopes: The slopes above the reservoir shoreline were generally mild to steep and were heavily wooded around the entire perimeter of the reservoir. There were no indications of shoreline slope distress or significant erosion along the perimeter of the reservoir. Considerable downtimber was noted at the shoreline.

(2) Acid Mine Drainage (AMD) Pond: A constructed earth embankment is located within the impoundment zone of the Montour No. 4 Refuse Bank. The embankment and pond are located just upstream of the right end of the Bank. The impounding embankment is approximately 40 feet high but the impoundment is relatively small and appears to contain a significant amount of AMD (yellow boy) sediments.

The crest of the pond embankment is approximately 40 feet below the crest of the Bank.

The yellow boy pond has a principal spillway consisting of two 12 inch diameter transite pipes that discharge to a rectangular open channel cut into rock on the right abutment of the Bank. The yellow boy pond discharge channel directs flow onto the lower right abutment slope and into the previously described drainage swale on the lower right abutment.

Should a failure of the yellow boy pond embankment occur, all discharge would be into the impoundment zone of Montour No. 4 Refuse Bank.

(3) Watershed: The watershed of Montour No. 4 Refuse Bank was generally as indicated by the USGS topogrpahic map. There was no indication of significant new construction or mining activity within the watershed. The watershed is primarily woodland but contains some grassland and residential development at the upper (south end).

h. Downstream Conditions:

(1) Downstream Channel: The downstream channel below the toe of the Bank is the original valley bottom of the unnamed tributary to Chartiers Creek. In the first 100 feet below the Bank, the valley bottom is relatively broad and completely covered with coarse coal refuse and reddog sediments deposited from surface runoff flows from the embankment and abutments.

Below this, the channel is relatively straight but narrow and densely vegetated on both banks with trees and brush. Considerable debris and refuse materials were observed in and about the channel bottom.

At approximately 800 feet below the toe of the Bank, the channel enters a concrete box culvert beneath a railroad embankment. The culvert was approximately six feet high and 7.5 feet wide and contained considerable refuse and reddog sediment deposits. The railroad embankment was approximately 25 feet above the valley bottom.

At approximately 1000 feet below the Bank, the unnamed tributary enters Chartiers Creek at a point approximately 2,000 feet upstream of Legislative Route 62014 Bridge.

(2) Floodplain Development: In the first 3,000 feet below the Montour No. 4 Refuse Bank, there are two railroad lines, one township road bridge, and at least five inhabited dwellings at elevations low enough to possibly be imperiled by high flows.

3.2 EVALUATION

The following evaluations are based on the visual inspection performed on 5 May 1981.

a. Embankment: The condition of Montour No. 4 Refuse Bank was fair. This assessment is based on observed conditions which included:

(1) Considerable and sometimes significant erosion of crest and upstream and downstream slopes of the embankment.

(2) Lack of vegetal covering that promotes the continued significant erosion of the embankment.

(3) No observed indications of embankment instability and no indications of a general high waterlevel within the embankment.

(4) Minor seepage through the embankment observed in exposed materials in the erosional gully in the lower downstream slope.

b. Outlet Works: The condition of the outlet works could not be evaluated. Operability of the pump was not checked but the owner's representative indicated that the facility is in working order and is used as required to maintain the resevoir pool level.

c. Downstream Conditions: Drainage from the Bank onto abutments and into the groins has caused some erosion of natural ground.

Considerable sedimentation of refuse materials has occurred downstream of the Bank, but adequate drainage conditions below the toe are little affected.

d. AMD Pond: The AMD dike and pond within the impoundment zone appeared to be in good condition.

e. Hazard Potential: The Montour No. 4 Refuse Bank was assigned a "significant" hazard potential rating. This rating was based on the observed height but limited impounding capacity of the embankment, and downstream conditions that included a railroad embankment obstruction and discharge to a broad creek valley (Chartiers Creek) prior to entering inhabited areas.

SECTION 4
OPERATIONAL FEATURES

4.1 PROCEDURE

Reservoir pool level is maintained by periodically using a portable pump to lower the water to a safe level. Normal operating procedure does not require a dam tender, but does require observation of the pool level during periods of high precipitation and/or runoff.

There is no spillway or permanent outlet works and there are no reported pipes through or beneath the Bank.

4.2 MAINTENANCE OF DAM

The embankment is not maintained.

4.3 INSPECTION OF DAM

The Consolidation Coal Company is required by the State of Pennsylvania to inspect the dam annually and make needed repairs.

The Consolidation Coal Company is requied by the Mine Safety and Health Administration (MSHA) to inspect the dam at least once every seven days and to make an annual report and certification of the dam.

4.4 WARNING PROCEDURE

There is no warning system and no formal emergency procedure to alert or evacuate downstream residents upon threat of a dam failure.

4.5 EVALUATION

The lack of a permanent system to maintain the reservoir pool level (principal spillway) is considered to be a deficiency.

The lack of a warning system, formal emergency plan and formal maintenance and inspection procedure is considered to be a deficiency.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

a. Design Data: The Montour No. 4 Refuse Bank has a watershed of 134 acres which is vegetated primarily by woodland. The watershed is about one half mile long and one third mile wide and has a maximum elevation of 1,270 feet (MSL).

There is no spillway or permanent outlet works facility. The pool is maintained at a level below Hidden Valley Road at the upstream end of the impoundment by a portable electric pump which is used when required.

An open channel has been constructed across the right abutment at approximately Elevation 1100 to provide drainage for an AMD pond that has been constructed on the Bank's impoundment zone. The channel defines the Bank's maximum impounding elevation.

A topographic saddle at the south end of the watershed has an approximate elevation of 1110, which compares with an approximate average Bank crest elevation of 1140 and an AMD discharge channel elevation of approximately 1100.

There is no information available on the required spillway capacity at the time of this facility's construction.

No hydrologic calculations were found relating reservoir/ spillway performance to the Probable Maximum Flood or fractions thereof.

b. Experience Data: Records are not kept of reservoir level or rainfall amounts. There is no record or report of the embankment ever being overtopped.

c. Visual Observations: On the date of the field inspection, the pool elevation was about 94 feet below the crest of Bank, or 64 feet below the saddle elevation and about 54 feet below the AMD pond discharge channel invert.

No permanent outlet facility was observed.

d. Overtopping Potential: Overtopping potential was investigated through the development of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir. The Corps of Engineers guidelines recommend the Probable Maximum Flood (PMF) for "large" size, "significant" hazard dams. Based on the size and hazard classification, the Montour No. 4 Refuse Bank's Spillway Design Flood (SDF) is the PMF.

Hydrometeorological Report No. 33 indicates the adjusted 24 hour Probable Maximum Precipitation (PMP) for the subject site is 19.3 inches. No calculations are available to indicate whether the reservoir is sized to store a flood corresponding to the runoff from 19.3 inches of rainfall in 24 hours. Consequently, an evaluation of the reservoir was performed to determine whether the dam's available storage capacity is adequate under current Corps of Engineers guidelines.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July 1978. The major methodologies and key input data for this program are discussed briefly in Appendix D.

The peak inflow to the Montour No. 4 Refuse Bank was determined by HEC-1 to be 728 cfs for a full PMF (SDF).

e. Adequacy: The available storage capacity of the reservoir was determined to be in excess of 100% of the PMF by HEC-1. According to Corps of Engineers' guidelines, the reservoir capacity of the Montour No. 4 Refuse Bank is "adequate" to store the inflow of a PMF event without overtopping the embankment.

SECTION 6
STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

a. Design and Construction Data: No design documentation or calculations were available for review.

b. Operating Records: There are no written operating records or procedures for this dam.

c. Mining Activity: The Pittsburgh Coal Seam lies about 280 feet below the dam and impoundment and has reportedly been extensively mined. The Waynesburg Coal Seam outcrops immediately beneath the dam and impoundment, but no records of mining activity were found.

d. Visual Observations:

(1) Embankment: The field inspection disclosed no evidence of a high ground water level in the embankment. The only seepage observed anywhere on the embankment consisted of three small wet spots in the steep coarse coal refuse slopes exposed in the large erosional gully in the lower downstream slope.

Some foundation seepage was noted in rock outcrops along the drainage swale across the right abutment. Though seepage flows were significant (10-20 gpm) there was no evidence of internal erosion (piping) of foundation materials.

Deep gullies have been eroded into the embankment slopes by surface runoff. The gullies appeared to be the result of long term erosion of the unvegetated coal refuse surfaces.

Locally, very steep slopes exist on all faces of the embankment, but little or no sloughing or slope instability were observed. The embankment slopes are also quite steep in a general sense as indicated by Field Section A-A. However, there were no signs of major slope stability such as cracks, scarps or anomolous bulges.

There were no indications of significant instability of any of the Bank's abutments.

(2) Mine Subsidence: No surficial evidence of mine subsidence was observed in the vicinity of the dam or impoundment.

e. Performance: No information was available on performance of Montour No. 4 Refuse Bank.

6.2 EVALUATION

a. Design Documents: No design documentation or calculations were available to evalutate the structure.

b. Embankment: Based on the results of the visual observations of embankment slopes, materials and seepage conditions, Montour No. 4 Refuse Bank appeared to be stable with respect to sliding stability.

The Bank has suffered and is continuing to suffer significant erosional degradation. Because of the massive nature of the embankment and the limited active impoundment zone, such distress has not reached a critical or dangerous stage. The Bank can nevertheless be assessed as instable with respect to erosional activity.

c. Seismic Stability: According to the Seismic Risk Map of the United States, Montour No. 4 Refuse Bank is located in Zone 1 where damage due to earthquakes would most likely be minor.

A dam located in Seismic Zone 1 may be assumed to present no hazard from an earthquake, provided static stability conditions are satisfactory and conventional safety margins exist. No calculations were developed to verify this assessment, however.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Evaluation:

(1) Embankment: Montour No. 4 Refuse Bank is considered to be in fair condition. This is based on visual observations of significant erosional degradation of embankment slopes. Lack of vegetal cover and uncontrolled surface drainage have promoted the observed erosion.

(2) Principal Spillway: Lack of an effective principal spillway is considered to be an operational deficiency. However, it is unlikely that the reservoir pool level will ever attain an elevation where problems such as overtopping or saturation of a critical portion of the embankment would arise.

Without effective spillways, the Refuse Bank's impoundment zone is capable of storing in excess of the Spillway Design Flood, which for a dam of this height and storage capacity is the PMF.

(3) Emergency Plans: The lack of a documented emergency operation and warning plan is considered to be a deficiency.

b. Adequacy of Information: The information available on design, construction, operation and performance history in combination with visual observations and hydrology and hydraulic calculations was sufficient to evaluate the embankment and appurtenant structures in accordance with the Phase I investigation guidelines.

c. Necessity for Further Studies: None.

d. Urgency: The recommendations presented in Section 7 should be implemented immediately.

7.2 RECOMMENDATIONS

a. Embankment Improvements: The owner should immediately develop and implement a plan for improving surface drainage and providing erosion control to halt the further degradation of the Montour No. 4 Refuse Bank. The improvements should be permanent and designed so as to require little or no maintenance.

b. Emergency Operation and Warning Plan: The owner should develop an Emergency Operation and Warning Plan including:

(1) Procedures for around-the-clock surveillance during emergency conditions.

(2) Procedures for drawdown of the reservoir under emergency conditions.

(3) Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

c. Maintenance and Inspection Procedures: The owner should develop written maintenance and inspection procedures in the form of checklists and step-by-step instructions.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL OBSERVATIONS CHECKLIST I
(NON-MASONRY IMPOUNDING STRUCTURE)

Name of Dam Montour No. 4 Refuse Bank County Washington State Pennsylvania National ID # PA 00865

Type of Dam Coarse Coal Refuse Hazard Category Significant

Dates of Inspection 5 May 1981 Weather Partly cloudy, warm Temperature 75°F

Pool Elevation at Time of Inspection 1046.0 (MSL)
Tailwater at Time of Inspection 910.9 (MSL)

Inspection Personnel:

J. E. Barrick, P.E.	Ackenheil & Associates, Project Manager and Hydrologist
J. P. Hannan	Ackenheil & Associates, Geotechnical Engineer
S. G. Mazzella	Ackenheil & Associates, Civil Engineer
H. Nagle	Consolidation Coal Company, Company Representative

Recorder J. E. Barrick

A1

GEO Project G80138-E
PennDER I.D. No. 63-92

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed. Numerous erosional gullies observed on both embankment slopes. Depth of gullies ranged from a few inches to several feet.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Considerable erosion of embankment slopes was observed consisting predominantly of gullies resulting from surface runoff. Depths ranged from a few inches to several feet. The gullies appeared to be the result of long term surface erosion of the unvegetated coal refuse surfaces. An erosional gully was observed on the right abutment below the toe of the embankment which appeared to be the result of surface runoff concentrated in a small side valley. In the lower reach of the gully, considerable bedrock strata was exposed in the side walls. Rock materials observed included fine to medium grained sandstone and very sandy shale materials. Some erosion of the left abutment of the embankment groin caused by surface runoff was observed.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (CONT'D)	There were no strong indications observed of either embankment or abutment slope instability. There were significant indications of downward movement of materials but these appeared to be primarily the result of erosion rather than colluvial movement. The downstream slope, particularly below the bench, was quite non-uniform being very steep at the top and flattening significantly toward the toe. In addition, large boulders of burned coarse refuse materials (reddog) were strewn about the lower slope area. No scarps or discontinuities, indicative of slope instability were observed either on the lower or upper downstream embankment slope.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical alignment of the crest was irregular. The high point of the crest was approximately at the center of the dam and the crest remained approximately level for several hundred feet to the left and right. The crest dipped significantly toward each abutment. At the right, the crest dropped to join a rock cut channel in the right abutment. The horizontal alignment of the embankment appeared to be generally straight and approximately perpendicular to the axis of the valley. The width of the crest varied significantly along its length. The minimum observed crest width was 80 feet and the maximum width was 125 feet.	
RIPRAP FAILURES	None observed.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	None observed.	
JUNCTION OF EMBANKMENT AND ABUTMENT	The junction of the embankment and the left abutment contained a surface drainage channel approximately at the toe of the embankment. The channel was eroded into natural ground to depths ranging from of a few inches to 3 to 4 feet. The channel alignment was winding and often blocked by downtimber, rocks and other debris. Near the lower portion of the embankment, the channel steepened significantly and followed a less defined channel which was strewn with rocks, downtimber and other debris. On the date of inspection, the channel was dry for its entire length. The junction of the embankment and right abutment was generally overgrown with trees, brush and dense weeds. No defined erosional channels were observed and, on the date of inspection, the groin area was dry.	
JUNCTION OF EMBANKMENT AND SPILLWAY	The junction of the embankment and the spillway (drainage channel at right abutment) was in good condition on the date of inspection. There was no indications of erosion or slope instability.	
ANY NOTICEABLE SEEPAGE	No seepage was observed anywhere on or immediately below the downstream slope of the embankment. There were no indications of seepage flows through and immediately beneath the embankment and there were no indications of current or previous wet, swampy conditions on or immediately below the embankment.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE (CONT'D)	The large, erosional gully into the lower slope near the center of the embankment contained coal refuse surfaces that were damp to moist and three small wet spots were observed in the gully walls. Seepage flows were too small to estimate. The sides of the cut were standing at very steep slopes. The condition appeared to have existed for a significant period of time.	
DRAINS	None observed.	
SURFICIAL CONDITIONS	The crest of the embankment was barren and consisted generally of coarse coal refuse materials. Numerous erosional gullies were observed crossing the crest to both the upstream and downstream slopes. Toward the left end of the embankment, the crest was covered by end-dumped earth and topsoil materials. The embankment's upstream face was barren and had a non-uniform slope from top to bottom and from abutment to abutment. From top to bottom, the slope ranged from very steep to steep and was crossed by numerous erosional gullies resulting from long term surface runoff. Considerable burned coarse coal refuse materials (reddog) were observed on the upstream slope. A pond access road was located in the right upstream groin and contained a large erosional gully that discharged to the pond.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFICIAL CONDITIONS (CONT'D)	The downstream face was divided into an upper and lower slope with a relatively large, sloping bench in between. The upper embankment slope was entirely barren coarse coal refuse materials with a configuration similar to the upstream slope. A large erosional gully was observed in the right central portion of the upper slope. The gully appeared to be the result of surface runoff from the crest area. A dry stream channel was observed below the gully passing onto the bench and draining into a large erosional gully near the center of the lower downstream slope. The lower downstream slope was heavily vegetated with trees, brush and weeds. Examination of lower slope embankment materials was difficult but they appeared to be coarse coal refuse. Numerous boulders and slope irregularities were observed on this portion of the embankment's downstream slope.	

PRINCIPAL (AND EMERGENCY) SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONFIGURATION	No principal or emergency spillway was observed during the site inspection. However, based on the observed freeboard, there appeared to be no need to have a spillway at this structure.	
AMD POND CHANNEL	A drainage channel for an AMD pond upstream of the Bank crosses the right abutment at the junction of the embankment. The channel has been cut into bedrock. In the unlikely event that the pond level should rise by more than 50 feet, the drainage channel would act as an effective spillway.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
PUMP	The reservoir level is maintained by infiltration and evaporation of water under normal conditions. Following significant rises in pool level due to precipitation, a pump, located near the upstream end of the pond, is activated to remove water to reduce the reservoir pool level.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION, SURVEYS	None observed.	
OBSERVATION WELLS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir shoreline slopes were observed to be generally mild to moderately steep and were wooded for the entire perimeter of the reservoir. Considerable downtimber was observed around the shoreline but there were no signs of significant shoreline erosion or instability. Township Road No. 754 (Hidden Valley Road) crosses the upstream end of the reservoir. The minimum roadway surface was 3.1 feet above the reservoir pool level on the date of inspection.	
SEDIMENTATION	The reservoir was observed to be extremely shallow, particularly in the lower end, as a result of deposition of acid mine drainage sediments (yellow boy) materials that were formerally pumped from the Montour No. 4 Mine.	
WATERSHED	The watershed was observed to be generally as indicated by the USGS topographic map. In general, the watershed is wooded with moderately steep to steep slopes. No new construction or mining activity was observed anywhere within the watershed. The ridgeline that bounds the watershed contains a saddle south of the reservoir. Based on visual observations from the crest of the embankment, the saddle appears to be considerably lower in elevation then the crest of the embankment.	

RESERVOIR (CONT'D)

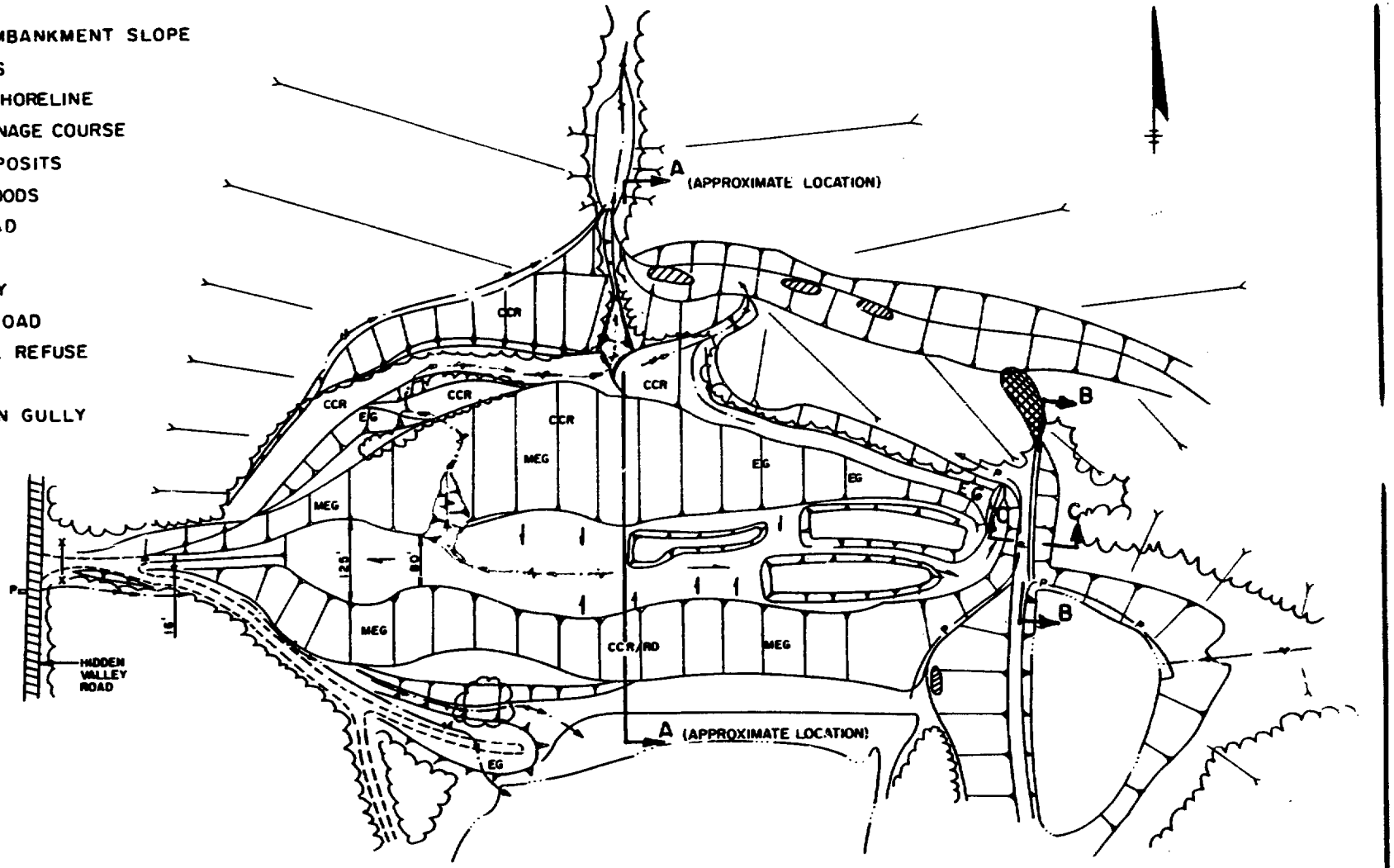
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
AMD TREATMENT POND	An earthen dike approximately 40 feet high has been constructed on the east reservoir slope immediately upstream of the Bank. The dike appears to have been constructed of materials excavated from the immediate hillside, creating a partially incised impoundment. The dike had generally uniform, partially vegetated slopes and appeared to be in good condition. A small seepage zone was observed on the lower portion of the dike's downstream slope but the seepage quantity was too small to estimate. A pond drainage channel in the right abutment has been previously described.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CHANNEL (CONDITION, OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel below the toe of the dam is approximately 40 feet wide for a distance of approximately 100 feet. The channel consists of coarse coal refuse and reddog materials deposited as sediment by surface runoff from the embankment and abutments. Below this, the channel enters the original creek valley which is narrow, winding and overgrown with trees and underbrush. Approximately 800 feet below the toe of the dam, the channel passes through a concrete box culvert beneath a railroad embankment. The culvert is approximately 6 feet high and 7.5 feet wide and contained considerable coarse refuse and reddog sediments on the date of inspection. Approximately 1000 feet below the toe of the embankment, the creek channel enters Chartiers Creek at a point approximately 2000 feet upstream of Lawrence, Pennsylvania.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	In the first 3000 feet below the embankment, there are at least five inhabited dwellings located in the Chartiers Creek valley at elevations low enough to possibly be affected by high flows.	

LEGEND

- IMPOUNDING EMBANKMENT SLOPE
- OTHER SLOPES
- STREAM OR SHORELINE
- SURFACE DRAINAGE COURSE
- SEDIMENT DEPOSITS
- TREES OR WOODS
- ASPHALT ROAD
- —P— PIPELINE
- EG, EG EROSION GULLY
- UNIMPROVED ROAD
- CCR COARSE COAL REFUSE
- RD RED DOG
- MEG MINOR EROSION GULLY
- SEEPAGE
- x——x FENCE

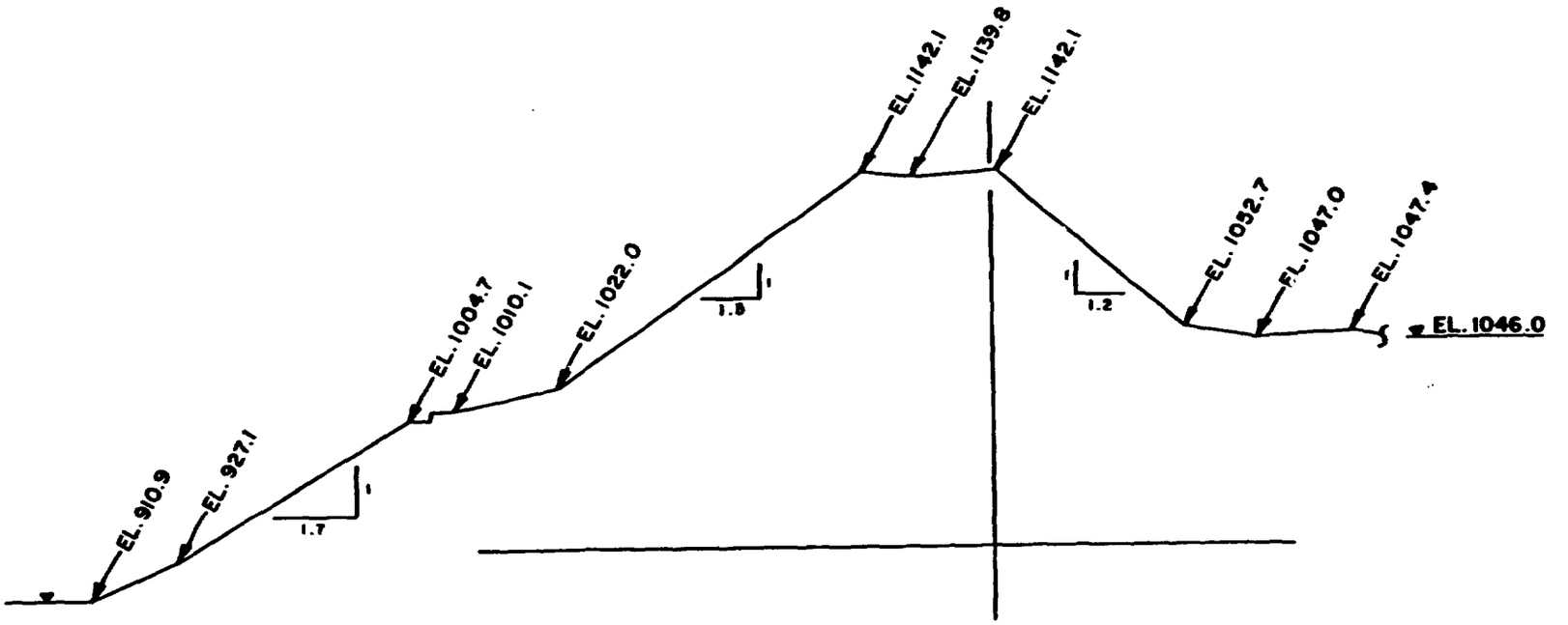


PLAN

No Scale

See Pages A14 and A15 For Sections A-A, B-Band C-C

DATE: JULY 1981	MONTOUR No.4 REFUSE BANK NATIONAL DAM INSPECTION PROGRAM	FIELD SKETCH
SCALE: NONE		
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD. PITTSBURGH PA 15216	
DWG. NO. 80136 E-1		

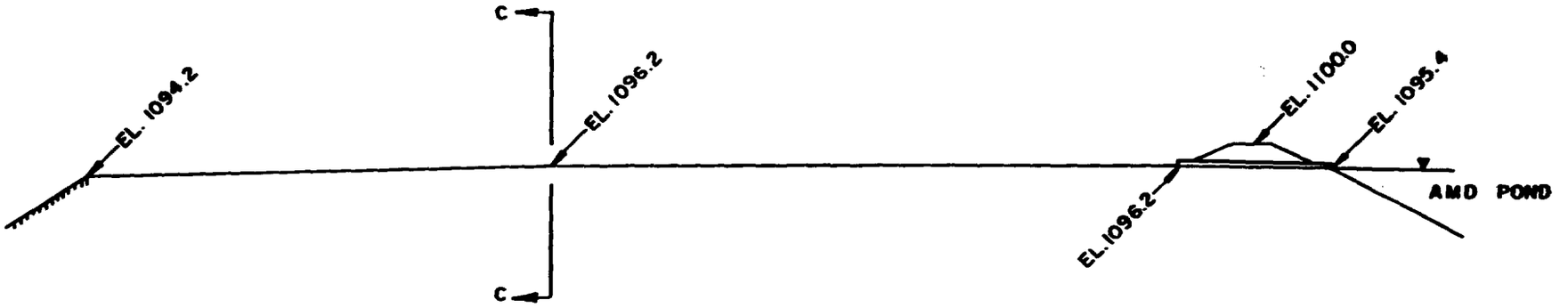


A14

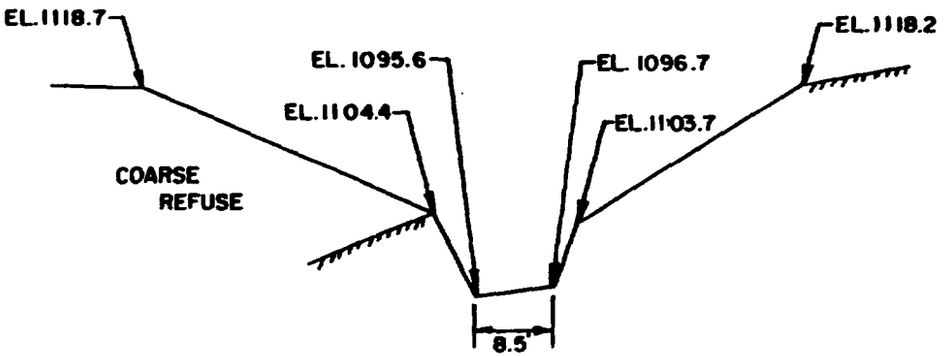
SECTION A-A

SCALE:
HORZ. 1"=100'
VERT. 1"=100'

DATE: JULY 1981		MONTOUR No.4 REFUSE BANK NATIONAL DAM INSPECTION PROGRAM	FIELD SECTION A-A
SCALE: AS SHOWN			
DR: JF	CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC.	
DWG. NO. 80138E-2		1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	



SECTION B-B
CHANNEL PROFILE
SCALE: 1"=20'



SECTION C-C
(LOOKING DOWNSTREAM)
SCALE: 1"=20'

DATE: JULY 1981	MONTOUR No.4 REFUSE BANK NATIONAL DAM INSPECTION PROGRAM	FIELD SECTIONS B-B AND C-C
SCALE: AS SHOWN		
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
DWG. NO. 80138E		

A15

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Montour No. 4 Refuse Bank
I.D. No. PA 00865

ITEM	REMARKS
Design Drawings	None available
As-Built Drawings	None available.
Regional Vicinity Map	USGS 7-1/2 Minute Bridgeville Pennsylvania Quadrangle Map.
*Construction History	Construction begun by Pittsburgh Coal Company and completed by Consolidation Coal Company. Construction begun in 1920's and ended in 1950's. Bank constructed by aerial tram dumping.
Typical Sections of Dam	None available.
Outlets-Plans Details Constraints Discharge Ratings	None available.
Rainfall/Reservoir Records	None available.
Design Reports	None available.
Geology Reports	None available.

ITEM	REMARKS
Design Computations	None available.
Hydrology and Hydraulics	None available.
Dam Stability	None available.
Seepage Studies	None available.
Materials Investigation, Boring Records, Laboratory, Field	None available.
Post-Construction Surveys of Dam	None recorded.
Monitoring Systems	None reported.
Modifications	None reported.
High Pool Records	None available.

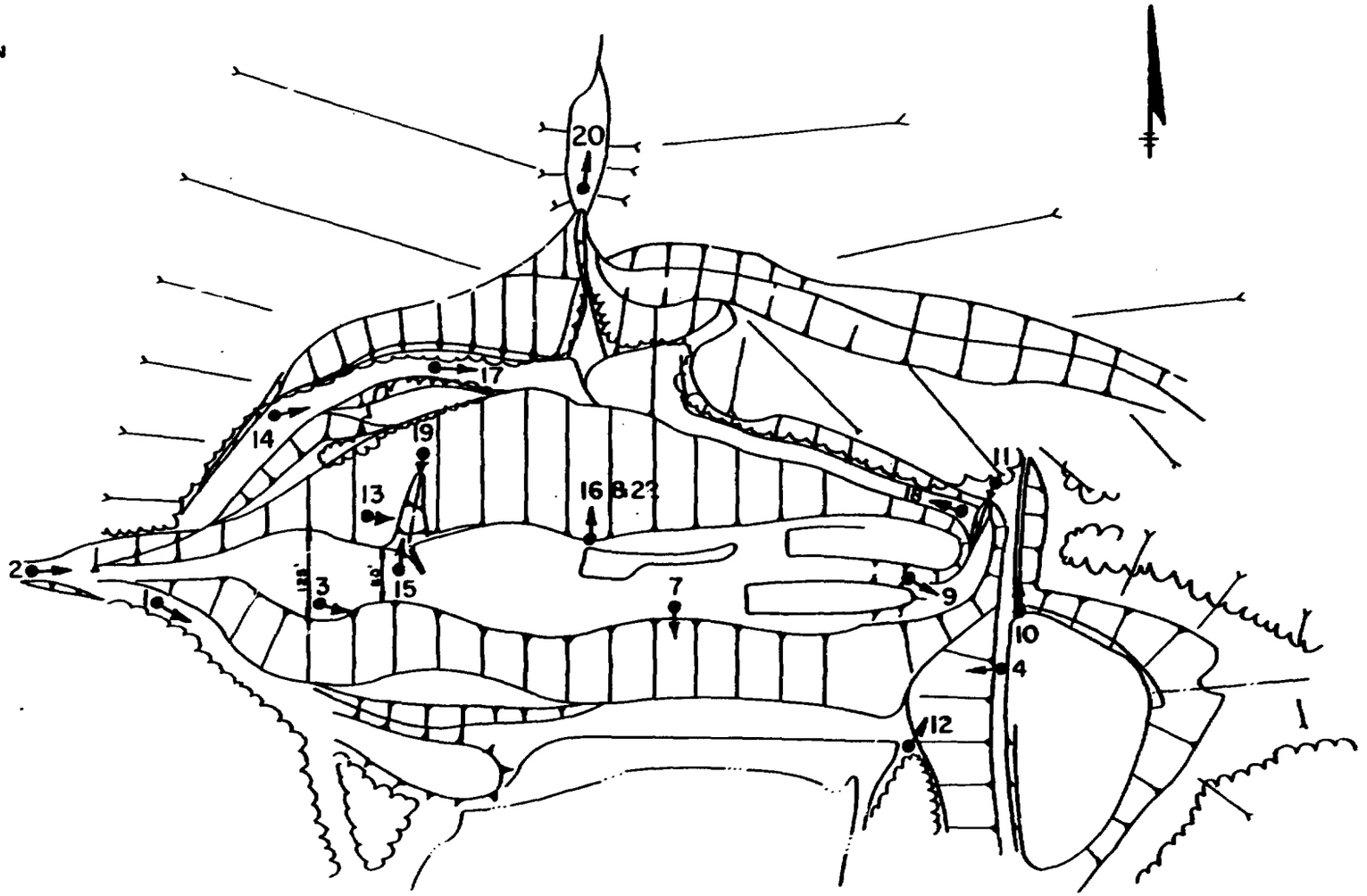
ITEM	REMARKS
Post-Construction Engineering Studies and Reports	None available.
Maintenance, Operation, Records	None available.
Spillway-Plan Sections Details	None available.
Operating Equipment Plans and Details	None available.
Specifications	None available.
Miscellaneous	None available.
Prior Accidents or Failure of Dam, Description Reports	None reported.

*Information obtained from owner's representative.

APPENDIX C

PHOTOGRAPHS

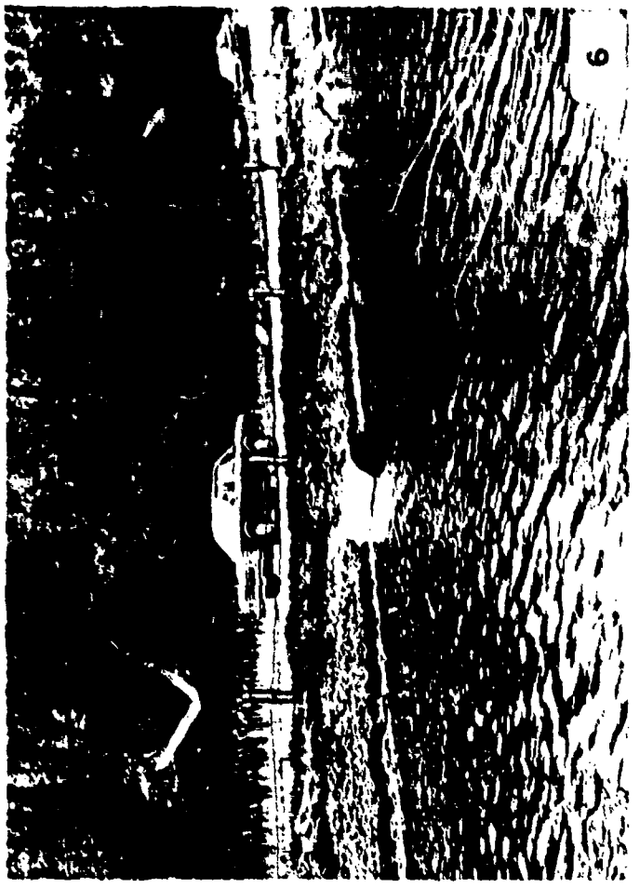
PHOTO 5,7,8,21,23 and 24
LOCATIONS ARE NOT SHOWN

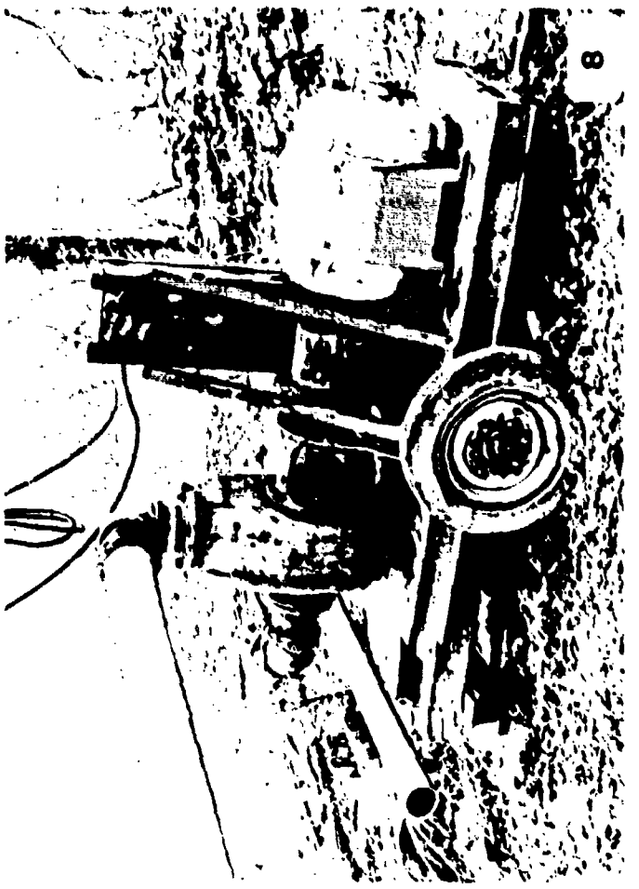


DATE: JULY 1981		MONTOUR No.4 REFUSE BANK NATIONAL DAM INSPECTION PROGRAM	PHOTO KEY MAP
SCALE: NONE			
DR: JF	CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
DWG. NO. 8038 E-1			

MONTOUR No 4 REFUSE BANK

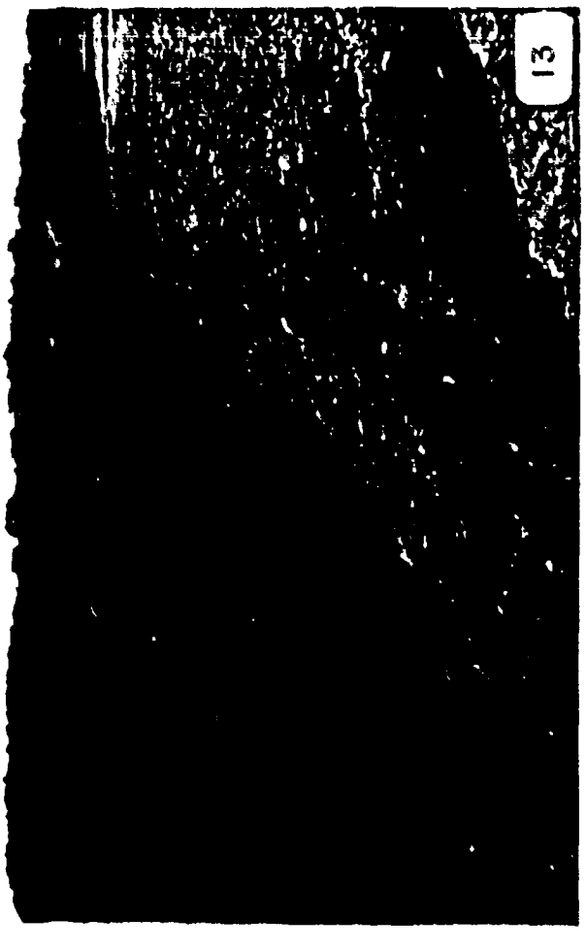
MONTOUR No. 4. REFUSE BANK





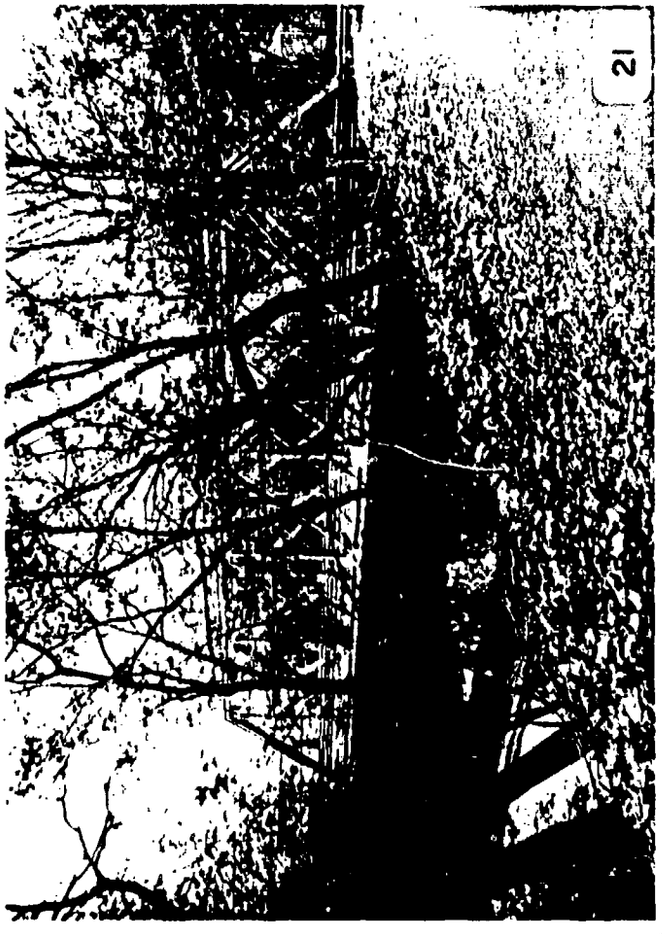
MONTOUR No. 4. REFUSE BANK

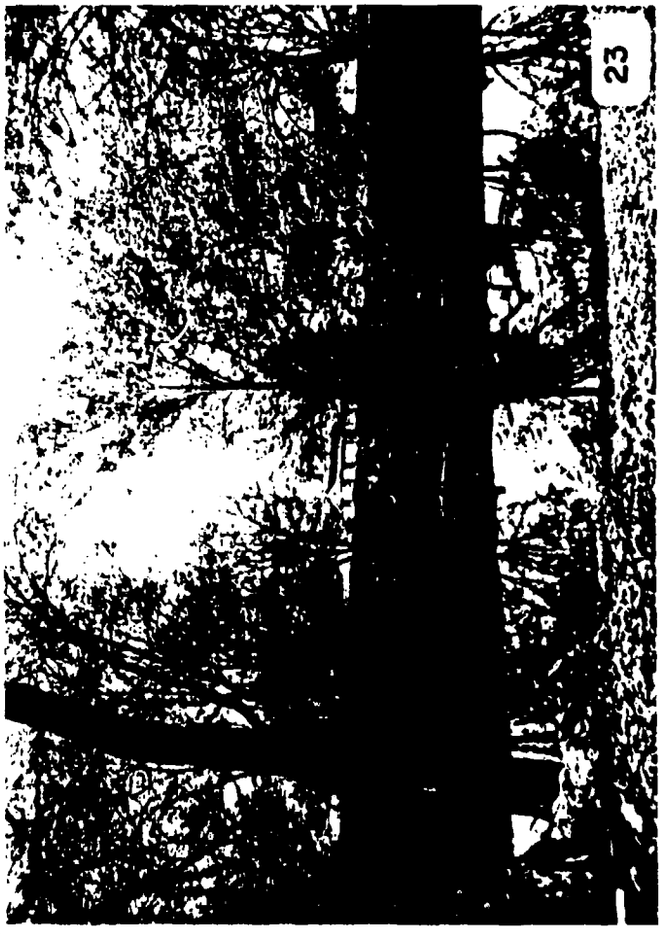
MONTOUR No. 4 REFUSE BANK



MONTOUR No. 4 REFUSE BANK

MONTOUR No. 4. REFUSE BANK





PHOTOGRAPH DESCRIPTIONS

Photo 1 Upstream Slope at left abutment.

Photo 2 Embankment Crest from left abutment.

Photo 3 Upstream Slope with AMD pond in background.

Photo 4 Upstream Slope Overview from AMD pond crest.

Photo 5 Embankment Overview from Hidden Valley Road.

Photo 6 Culvert beneath Hidden Valley Road.

Photo 7 Reservoir Overview from embankment crest.

Photo 8 Pump for drawdown of reservoir.

Photo 9 Erosional Gully on crest with AMD pond in background.

Photo 10 Channel in Right Abutment looking downstream.

Photo 11 Erosion Gully in downstream right abutment.

Photo 12 Seepage at toe of AMD pond.

Photo 13 Downstream Slope from left end of embankment.

Photo 14 Left Groin and Minor Bench.

Photo 15 Erosional Gully in left portion of embankment at the crest.

Photo 16 Downstream Slope showing erosional gully in lower downstream slope and AMD Treatment Plant.

Photo 17 Downstream Slope and Bench from left abutment.

Photo 18 Downstream Slope and Bench from right abutment.

Photo 19 Erosional Gully in lower downstream slope.

Photo 20 Downstream Toe Area.

Photo 21 Downstream Hazard, bridge crossing Chartiers Creek.

Photo 22 Downstream Hazard, AMD Treatment Plant.

Photo 23 Downstream Hazard, inhabited dwellings.

Photo 24 Downstream Hazard, culvert beneath railroad embankment.

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology: The dam overtopping analysis was accomplished using the systemized computer program HEC-1 (Dam Safety Version), July, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation: The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 33" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph: The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters, their definition and how they were obtained for these analyses.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream in miles	From USGS 7.5 minute topographic map
Lca	Length on main stream to centroid of watershed	From USGS 7.5 minute topographic map
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From USGS 7.5 minute topographic map

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing: Reservoir routing is accomplished by using Modified Puls routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation-discharge relationship.

Storage in the pool area is defined by an area-elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or USGS 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping: Using given percentages of the PMF, the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominately woodland, some residential development noted.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1046 (347 acre-feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1100 (1749 acre-feet).

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1140 (Approximate average)
1100 (AMD Pond Discharge Channel)

OVERFLOW SECTION

a. Elevation 1100 (approximate)
b. Type Open channel
c. Width 8.5 feet
d. Length 230 feet
e. Location Spillover Right abutment of Bank
f. Number and Type of Gates None
g. Side Slopes Vertical (rock cut)

OUTLET WORKS

a. Type Portable pump
b. Location Near upstream end of impoundment
c. Entrance Inverts Unknown
d. Exit Inverts Unknown
e. Emergency Drawdown Facilities Pump

HYDROMETEOROLOGICAL GAGES

a. Type None
b. Location N/A
c. Records None

MAXIMUM REPORTED NON-DAMAGING DISCHARGE None reported

HEC-1 DAM SAFETY VERSION
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Montour No. 4 Refuse Bank	NDI ID NO. PA 00865
Probable Maximum Precipitation (PMP)	24.1*
Drainage Area	0.21 sq. mi.
Reduction of PMP Rainfall for Data Fit Reduce by 20%, therefore PMP rainfall	0.8 (24.1) =19.3 in.
Adjustments of PMF for Drainage Area (Zone 7)	
6 hrs.	102%
12 hrs.	120%
24 hrs.	130%
48 hrs.	140%
Snyder Unit Hydrograph Parameters	
Zone	28**
C_p	0.57
C_t	1.70
L =	0.53 mile
L_{ca} =	0.27 mile
$t_p = C_t [(L)(L_{CA})]^{0.3}$	0.95 hour
Loss Rates	
Initial Loss	1.0 inch
Constant Loss Rate	0.05 inch/hour
Base Flow Generation Parameters	
Flow at Start of Storm	1.5 cfs/sq.mi=0.32 cfs
Base Flow Cutoff	0.05 x Q peak
Recession Ratio	2.0

---

* Hydrometerological Report 33

** Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

ACKENHEIL & ASSOCIATES
GEO Systems, Inc.
1000 Banksville Road
PITTSBURGH, PA. 15216
(412) 531-7111

Job MONTOUR No. 4 REFUSE Job No. 80138-E

Subject DATA INPUT

Made By SGM Date 12 June 81 Checked JEB Date 6/19/81

LOSS RATE AND BASE FLOW PARAMETERS

STRTL = 1 INCH
CNSTL = 0.05 IN./HR.
STRTQ = 1.5 CFS/SQ. MI.
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2.0

ELEVATION - STORAGE RELATIONSHIPS

THERE IS NO INFORMATION AVAILABLE CONCERNING THE STORAGE CAPACITY OF THIS FACILITY. THEREFORE A STAGE - STORGE RELATIONSHIP WAS DEVELOPED USING A 1979 BRIDGEVILLE 7.5 MIN. QUADRANGLE

ELEV.	AREA (ACRE)	ΔSTOR (AC.-FT.)	STOR (AC.-FT.)
980	0		0
		17.7	
1000	2.66		17.7
		80.0	
1020	5.51		97.7
		162.2	
1040	11.02		259.9
		290.8	
1060	18.37		550.7
		473.3	
1080	29.39		1024.0
		724.6	
1100	43.53		1748.6

$S	0	18	98	260	551	1024	1749
$E	980	1000	1020	1040	1060	1080	1100

ACKENHEIL & ASSOCIATES
GEO Systems, Inc.
1000 Banksville Road
PITTSBURGH, PA. 15216
(412) 531-7111

Job MONTOUR No. 4 Job No. 80138-E

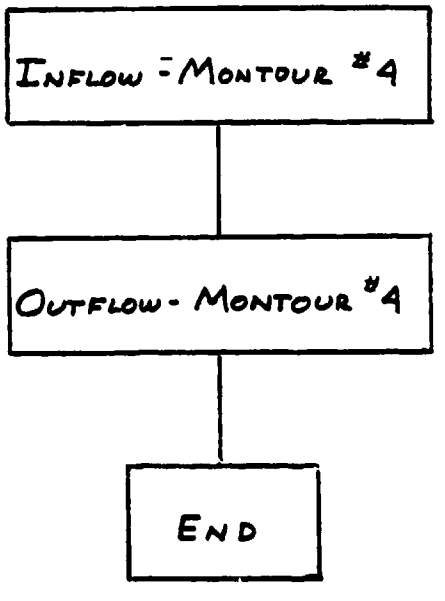
Subject DATA INPUT

Made By SAM Date 12 JUN 81 Checked JES Date 6/19/81

OVERTOP PARAMETERS

TOP OF DAM ELEVATION (MINIMUM)	1100' ±
LENGTH OF EMBANKMENT	1400 FEET
COEFFICIENT OF DISCHARGE	3.09

PROGRAM SCHEDULE



```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1              A1       NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
    2              A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF MONTOUR #4 REFUSE BANK
    3              A3       PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD
    4              B   300       0      10       0       0       0       0       0      -4       0
    5              B1    5
    6              J     1       2       1
    7              J1   1.      .5
    8              K     0       1                                       1
    9              K1       INFLOW HYDROGRAPH FOR MONTOUR #4 REFUSE BANK
   10              M     1       1    0.21            0.21                                       1
   11              P            24.1     102     120     130     140
   12              T                                                   1.0     .05
   13              W  0.95    0.57
   14              X  -1.5   -0.05     2.0
   15              K     1       2                                       1
   16              K1       ROUTING AT MONTOUR #4 REFUSE BANK
   17              Y                                       1       1
   18              Y1    1                                                -1046.
   19              $S    0.      18.     98.    260.    551.   1024.   1749.
   20              $E  980.    1000.   1020.  1040.   1060.   1080.   1100.
   21              $$ 1046.    .001    3.09    1.5
   22              $D 1098.    3.09     1.5  1400.
   23              K     99
   24              A
   25              A
   26              A
   27              A
   28              A

                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           2
                                END OF NETWORK

**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE: 19 JUN 81
RUN  TIME: 12.19.32

                        NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
                        HYDROLOGIC AND HYDRAULIC ANALYSIS OF MONTOUR #4 REFUSE BANK
                        PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD

                                        JOB SPECIFICATION
                    NQ      NHR     NMIN     IDAY     IHR     IMIN    METRC    IPLT    IPRT   NSTAN
                   300        0       10        0       0        0        0       0      -4       0
                                              JOPER     NWT   LROPT   TRACE
                                                  5       0       0       0

                                MULTI-PLAN ANALYSES TO BE PERFORMED
                                    NPLAN= 1 NRTIO= 2 LRTIO= 1
                            RTIOS=   1.00   0.50

**********      **********      **********      **********      **********
```

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR MONTOUR #4 REFUSE BANK

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.21	0.0	0.21	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	24.10	102.00	120.00	130.00	140.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0	0.0

UNIT HYDROGRAPH DATA

TP= 0.95 CP=0.57 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG= 0.95 HOURS, CP= 0.57 VOL= 1.00

5.	20.	39.	60.	75.	82.	78.	67.	57.	49.
42.	35.	30.	26.	22.	19.	16.	14.	12.	10.
8.	7.	6.	5.	4.	4.	3.	3.	2.	2.
2.	1.	1.	1.	1.	1.	1.			

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.99	24.57	2.42	19896.
										(686.)	(624.)	(61.)	(563.39)

****

HYDROGRAPH ROUTING

ROUTING AT MONTOUR #4 REFUSE BANK

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-1046.	0

CAPACITY=	0.	18.	98.	260.	551.	1024.	1749.
ELEVATION=	980.	1000.	1020.	1040.	1060.	1080.	1100.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1046.0	0.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1098.0	3.1	1.5	1400.

PEAK OUTFLOW IS 0. AT TIME 50.00 HOURS

PEAK OUTFLOW IS 0. AT TIME 50.00 HOURS

****

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	 RATIO 2 0.50
HYDROGRAPH AT	1	0.21	1	728.	364.
	(	0.54)	(	20.61)(	10.31)(
ROUTED TO	2	0.21	1	0.	0.
	(	0.54)	(	0.01)(	0.00)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	1046.00	1046.00	1100.00
	STORAGE	347.	347.	1746.00
	OUTFLOW	0.	0.	1.

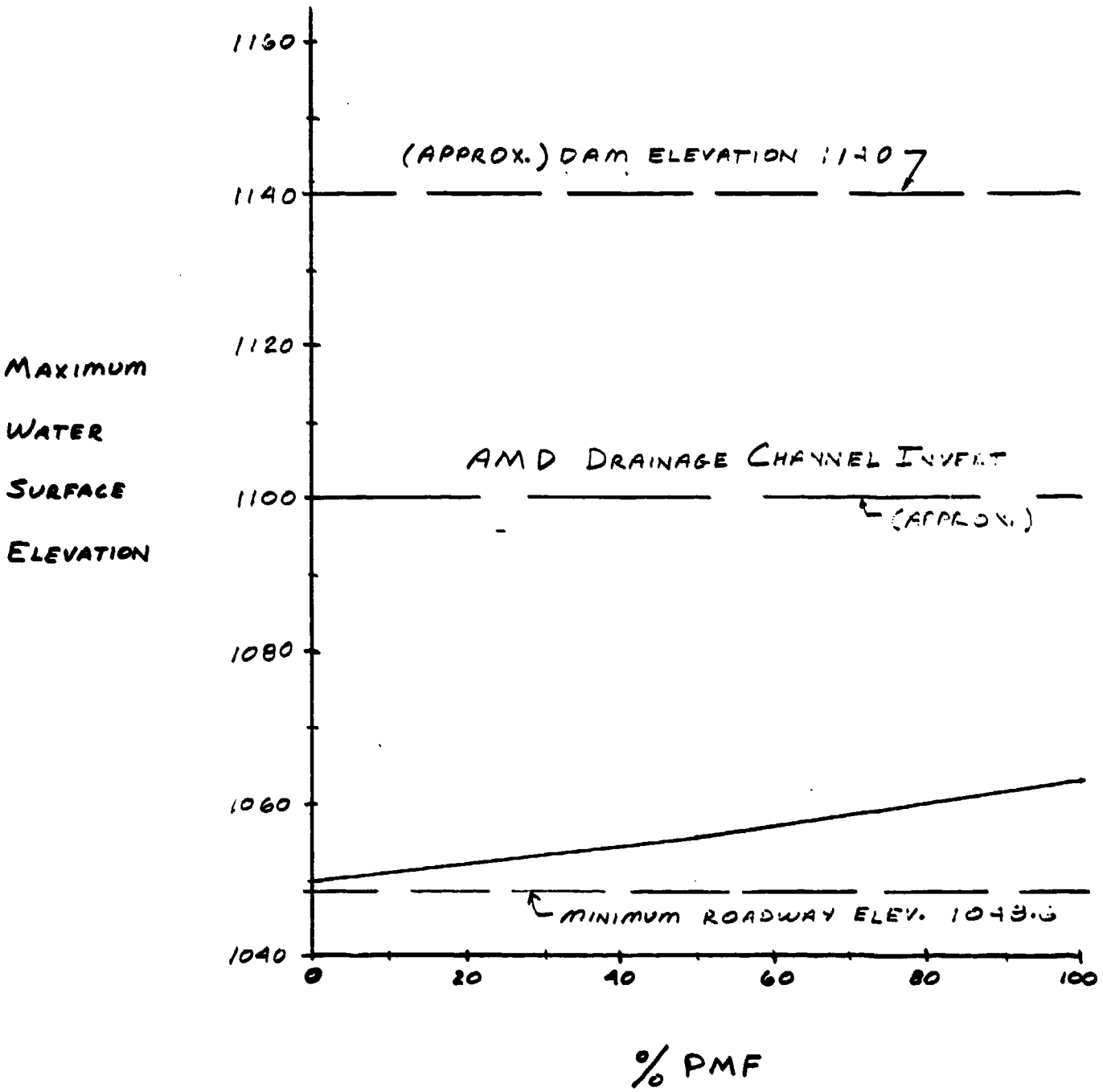
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1062.95	0.0	621.	0.	0.0	50.00	0.0
0.50	1055.39	0.0	484.	0.	0.0	50.00	0.0

ACKENHEIL & ASSOCIATES
GEO Systems, Inc.
1000 Banksville Road
PITTSBURGH, PA. 15216
(412) 531-7111

Job MONTOUR No. 4 Job No. 80138 "E"

Subject HYDROLOGIC PERFORMANCE PLOT

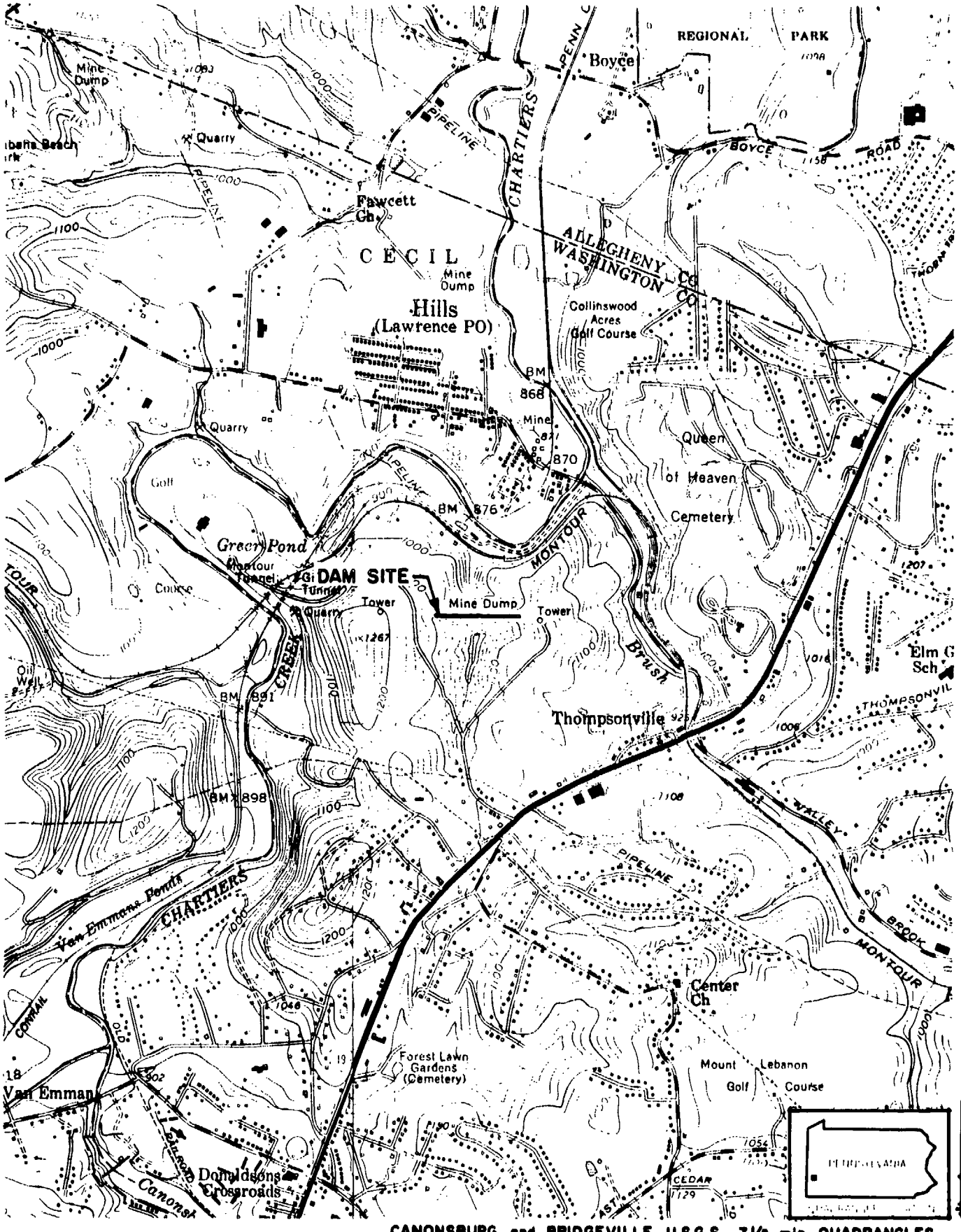
Made By SGM Date 12 June Checked _____ Date _____



APPENDIX E

PLATES

LIST OF PLATES



CANONSBURG and BRIDGEVILLE U.S.G.S. 7½ min. QUADRANGLES

DATE: JULY 1981	MCNTOUR No.4 REFUSE BANK NATIONAL DAM INSPECTION PROGRAM	REGIONAL VICINITY MAP
SCALE: 1" = 2000'		
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
PLATE I		

APPENDIX F

GEOLOGY

GEOLOGY

Geomorphology

The Montour No. 4 Refuse Bank is located within the Pittsburgh Plateau section of the Appalachian Plateau Physiographic Province. This area is characterized by gently folded sedimentary rocks which have been incised by streams to form steep sided valleys. The site is located on a small unnamed tributary to Chartiers Creek. The valley bottom of the unnamed tributary is about 400 feet below the adjacent hilltops. These rounded hilltops are at Elevation 1200 to 1300 feet, and in a regional sense are part of a broad, undulating plateau.

Structure

The site lies on the eastern flank of the "Ninevah" Syncline, the axis of which plunges to the southwest. Strata in the immediate vicinity of the dam dip to the south at an average rate of about 0.4 degree. Faulting has not been documented in the area of the dam and no observations were made that would indicate faulting in the rocks outcropping around the dam.

Stratigraphy

Rocks outcropping in the vicinity of the site belong to the Pennsylvanian Age Monongahela Formation and the Permian Age, Waynesburg and Washington Formations. The major rock types in these formations are cyclic sequences of shale, limestone, sandstone, and coal. The Carmichaels Formation represents unconsolidated terrance sand and gravel of Quaternary age.

Mining Activity

The Pittsburgh Coal Seam, the lowermost unit of the Monongahela Formation, lies about 280 feet below the dam and has been extensively deep mined. The Waynesburg Coal Seam, which is the lowermost unit of the Waynesburg Formation, outcrops immediately beneath the dam but has probably not been mined.

CANONSBURG and BRIDGEVILLE QUADRANGLES
WASHINGTON Co., PENNSYLVANIA

SCALE: 0 — ½ MILE 1:24000

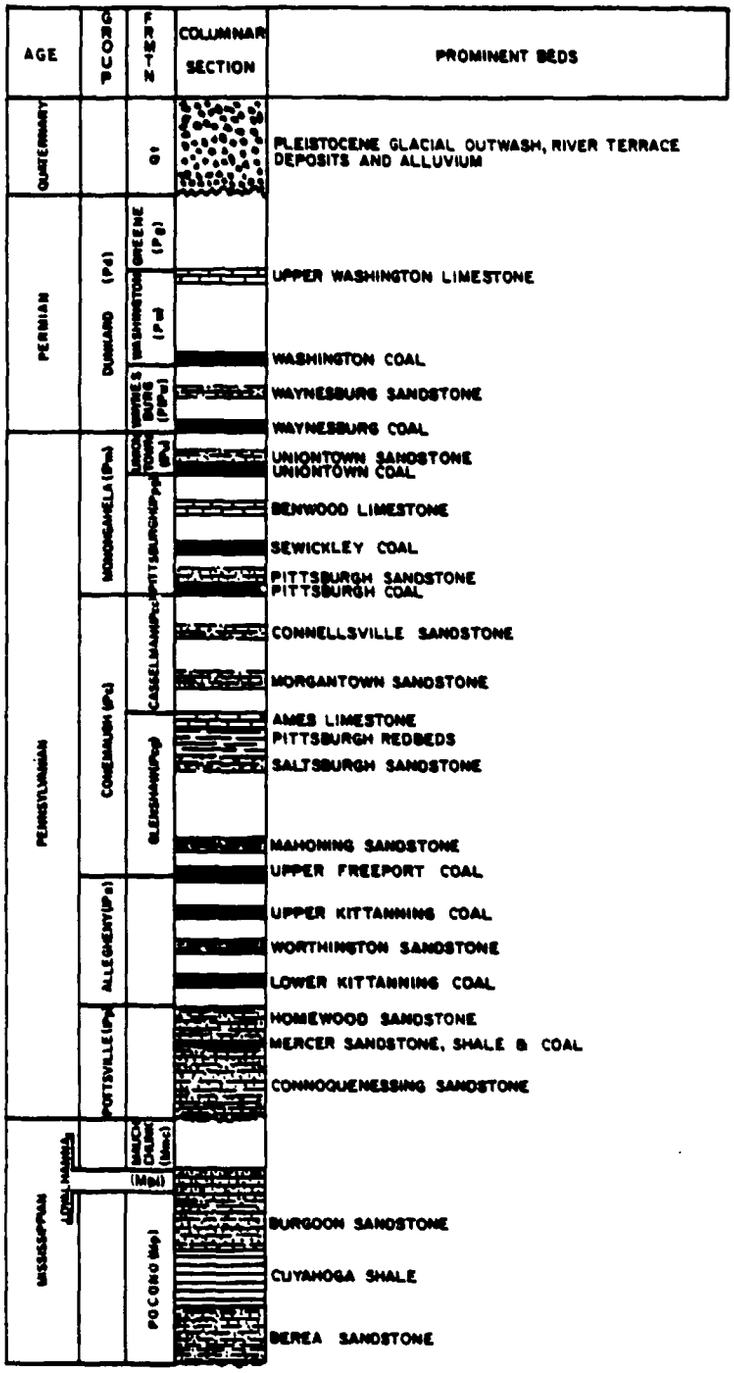
CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL

——— FORMATION CONTACT

DATA OBTAINED FROM PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY GREATER PITTSBURGH REGION GEOLOGIC MAP AND CROSS SECTIONS, 1975 and GREATER PITTSBURGH REGION STRUCTURE CONTOUR MAP, 1975

DATE: JULY 1981	MONTOUR No. 4 REFUSE BANK	GEOLOGIC MAP
SCALE: 1" = 2000'	NATIONAL DAM INSPECTION PROGRAM	
DR: JF / CK: JEB	ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC. CONSULTING ENGINEERS 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	

PR 8717-870



DATE: JULY 1981	MONTOUR No. 4 REFUSE BANK NATIONAL DAM INSPECTION PROGRAM	GEOLOGIC COLUMN
SCALE: 1"=360		
DR: JF CK:	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH PA 15216	